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Jennifer D. Ahearn

Jennifer Ahearn

PATENT
Atty. Docket No. 30454-21
[P-3094]

In the United States Patent and Trademark Office
Before the Board of Patent Appeals and Interferences

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TECHNOLOGY CENTER 2800

In re Application of:

EDWARD W. LIU

Serial No.: 08/840,947

Filed: April 21, 1997

For: NOISE CANCELLATION IN MIXED SIGNAL ENVIRONMENT

Group Art Unit: 2816

Examiner: D. Le

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLCATION - 37 C.F.R. § 192)

Sir:

Transmitted herewith, in triplicate, is the Appeal Brief in the above-referenced patent application, with respect to the Notice of Appeal filed on April 29, 1999.

U.S. Serial No. 08/840,947

This Appeal Brief is being submitted on behalf of Assignee, LSI Logic Corporation, a corporation other than a small entity.

Pursuant to 37 C.F.R. § 1.17(f) enclosed please find a check in the amount of $300.00 to cover the filing fee for the Appeal Brief. If any additional fees are due for the filing or the Appeal Brief, the Commissioner is authorized to charge them to Deposit Account No. 13-3735.

Respectfully submitted,

MITCHELL, SILBERBERG & KNUPP LLP

Dated: June 28, 1999

By____________________________
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OIPE JUN 28 1999 PATENT & TRADEMARK OFFICE

#13 Appeal Brief T. 4wDG 7-7-99

PATENT
Atty. Docket No. 30454-21
[P-3094]

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APPELLANTS' BRIEF
ON APPEAL TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

Commissioner of Patents and Trademarks
Washington, DC 20231

Dear Sir:

Appellant in the above-captioned patent application appeals the final rejection of Claims 1 to 18 and 20 to 29 set forth in the Office Action mailed February 1, 1999.

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I. REAL PARTY IN INTEREST

The real party in interest in this application is LSI Logic Corporation, a Delaware corporation, pursuant to an assignment which was recorded on April 21, 1997 at Reel 8511, Frame 0700.

II. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1 to 18 and 20 to 29 have been finally rejected and are the subject matter of this appeal. Claim 19 has been canceled. In accordance with 37 C.F.R. § 1.192(c)(9), a copy of the claims involved in this appeal is included in the Appendix attached hereto.

IV. STATUS OF THE AMENDMENTS

The status of the amendments filed subsequent to the final rejection is as follows. An Amendment After Final Rejection was filed on April 7, 1999. The Examiner's Advisory Action dated April 21, 1999 indicates that the amendments proposed therein would be entered upon the filing of a Notice Of Appeal and an Appeal Brief. Accordingly, the claims set forth in the Appendix incorporate those amendments.

A Supplemental Amendment After Final Rejection was filed on May 17, 1999. The Examiner's Advisory Action dated June 1, 1999 indicates that the amendments proposed therein would be entered upon the filing of a Notice Of Appeal and an Appeal Brief. Accordingly, the claims set forth in the Appendix also incorporate these amendments.

V. SUMMARY OF THE INVENTION

The present invention concerns noise cancellation and is particularly applicable to noise cancellation in mixed signal environments. Generally speaking, the present invention operates on the assumption that the output of a circuit includes two components: a component that is a function of the signal input into the circuit (the input signal component) and a component that is a function of noise experienced by the circuit (the noise component). See page 4, lines 11 to 23.

The input signal component of a circuit's output depends upon a number of factors, such as the specific input signal, the circuit components utilized, and the manner in which those components are interconnected. Once the circuit is defined, a given input signal typically will always result in the same input signal component at the output.

Because noise (such as electromagnetic environmental noise) is experienced throughout the circuit, rather than being input at a defined input terminal, the noise component depends upon somewhat different factors. Specifically, the noise component of a circuit's output typically depends upon factors such as: the types of noise sources present, the signals driving such noise sources, the circuit design, and the proximity and orientation of the circuit to those noise sources. It should be noted that proximity and orientation to noise sources often must be evaluated on a component level, rather than on a circuit level. In other words, the effect of a noise source on any given circuit generally will be the accumulated result of the effects of the noise source on each individual component and each interconnecting wire (or routing element, in the case of an integrated circuit) in the circuit. Accordingly, the precise physical layout of each component and interconnection making up a circuit will often affect the circuit's response to a noise source. Such a layout, therefore, must usually take into account,

for each element (i.e., component and interconnection) in the circuit, the element's distance from, and orientation relative to, known noise sources.

Generally, the present invention cancels the noise component of a first circuit's output by introducing a second circuit that produces approximately the same noise component as the first circuit. See, for example, page 6, lines 7 to 10. Often, this will mean that the second circuit has components and interconnections that are identical to those of the first circuit and that the physical layout (i.e., proximity and orientation) of those components and interconnections is identical to the physical layout of the second circuit, or at least that those components and interconnections are otherwise arranged to result in the same noise component. In the preferred embodiment of the invention, the noise source is another circuit or circuit element that is included within the overall design. Typically, the noise source is a digital circuit and the circuit for which noise cancellation is desired is an analog circuit. See page 4, lines 17 to 22 of the specification. Because the placement of all such circuit components is within the control of the designer, it generally will be possible to arrange the first circuit, the second circuit and the noise source in such a way that the first and second circuits will output approximately the same noise component. However, as indicated above, laying out the circuit to achieve this result requires consideration of several additional factors.

The output of the second circuit is then combined with the output of the first circuit to reduce the noise component of the first circuit. In the preferred embodiment of the invention, such combination is accomplished simply by subtracting the output of the second circuit from the output of the first circuit, thereby largely eliminating the noise component of the first circuit. See page 6, lines 11 to 19.

The design considerations for insuring equal noise components are discussed above. It is also desirable to control the input signal component of the second circuit's output so that the combination of the two outputs will correlate as closely as possible

with the input signal component of the first circuit's output. Two solutions proposed in the specification are to control the input signal component of the second circuit's output to be a null output (page 5, lines 10 to 20) or to be the inverse of the input signal component of the first circuit's output (page 7, lines 8 to 9). In either case, when the two outputs are subtracted the result will be identical to the input signal component of the first circuit's output, subject possibly to a scaling factor. Such a scaling factor can subsequently be eliminated, such as by using a halving circuit (page 8, lines 4 to 8).

As defined in independent claim 1, the invention is directed to a circuit which includes a first circuit, a second circuit and a subtractor circuit. The first circuit has a first input and a first output, which includes a function of a signal at the first input and also includes a first noise component resulting from noise experienced by the first circuit. The noise typically is electromagnetic environmental noise (claim 21) and may be caused, for example, by a digital circuit located proximate to the first and second circuits (claim 2). The second circuit, which may be identical to the first circuit (claim 20; page 5, lines 21 to 23), is located proximal to the first circuit and has a second input and a second output, the second output including a function of a signal at the second input and also including a second noise component resulting from noise experienced by the second circuit. Preferably, the second circuit is located close enough to the first circuit so that the second circuit experiences approximately the same noise as the first circuit (claim 22; page 6, lines 7 to 9). It is a feature of this aspect of the invention that the second noise component is approximately equal to the first noise component. The subtractor circuit, which may be either digital (claim 23; Figure 4A) or analog (claim 24; Figure 4B), is connected to the first circuit and to the second circuit and subtracts the second output from the first output. The circuit optionally includes a halving circuit which inputs a signal having an input amplitude and outputs the signal at one-half the input amplitude (claim 3; page 8, lines 4 to 5).

Independent claim 4 is directed to a circuit that includes first, second and third circuits. The first circuit has a first input and a first output, the first output including a function of a signal at the first input and also including a first noise component resulting from noise experienced by the first circuit. The second circuit has a second input and a second output, the second output including an input signal component which is a function of a signal at the second input and also including a second noise component resulting from noise experienced by the second circuit, the input signal component being a null output, and the second noise component being approximately equal to the first noise component. The third circuit has a third input connected to the first output and a fourth input connected to the second output to subtract the second output from the first output.

Independent claim 7 is directed to a circuit that includes a first circuit having a first input and a first output, the first output including a function of a signal at the first input and also a noise component resulting from noise experienced by the first circuit. Also provided is a second circuit having a second input and a second output, a signal supplying circuit supplying to the second input a signal which is the inverse of the signal at the first input. A third circuit has a third input connected to the first output and a fourth input connected to the second output, and subtracts the second output from the first output.

Independent claim 11 is directed to an integrated circuit chip (IC) that includes a plurality of analog circuits, each proximal to each other, and each of the plurality of analog circuits producing an output signal which includes a function of an input signal and also includes a noise component resulting from noise experienced by the plurality of analog circuits. A noise separator circuit, proximal to the plurality of analog circuits, produces a noise signal based on noise experienced by the noise separator circuit, the noise signal being approximately equal to the noise component of the output signal

output by each of the plurality of analog circuits. A noise canceling circuit processes the output signals with the noise signal to reduce the noise component of the output signal output by each of the plurality of analog circuits.

Independent claim 14 is directed to a noise cancellation method. According to this method, a first signal is supplied to a first circuit, and a first output is read from the first circuit. A signal is supplied to a second circuit which results in a null output from the second circuit, the second circuit being located proximal to the first circuit, and a second output is read from the second circuit. The first output is then combined with the second output to produce a combinational output, the noise component of the first output due to noise experienced by the first circuit being approximately equal to the noise component of the second circuit due to noise experienced by the second circuit.

By utilizing a second circuit designed and laid out so as to have approximately the same noise component as the first circuit and then combining the two circuits' outputs in the foregoing manner, the present invention often can significantly reduce the output noise component of the first circuit while maintaining the integrity of the input signal component. As noted in the "Description of Related Art" section of the patent application, this technique generally can cope with noise in a much more space-efficient manner than prior art techniques such shielding or isolation. The invention has particular application in mixed signal integrated circuit chips, where digital components create significant noise which might otherwise interfere with the operation of analog components, and where space is at a premium.

VI. ISSUES PRESENTED ON APPEAL

The issues are whether claims 1, 2, 4 to 7, 9 to 16, 20 to 22 and 24 to 29 are properly rejected under 35 U.S.C. § 102(e) over U.S. Patent 5,546,458 (Iwami) and

whether claims 3, 8, 17, 18 and 23 are properly rejected under 35 U.S.C. § 103(a) over Iwami.

VII. GROUPING OF THE CLAIMS

In the Office Action, the Examiner rejected all of claims 1, 2, 4 to 7, 9 to 16, 20 to 22 and 24 to 29 together, but provided only a one-sentence explanation for rejecting claim 1, although the previous Office Action also presented a one-sentence explanation of the grounds for rejecting claims 2, 5 and 9. Similarly, only a brief one-paragraph explanation was provided for the rejection of claims 3, 8, 17, 18 and 23. The Examiner did not point out in the Office Action where each element or limitation of each claim is taught by the prior art and where specifically in that prior art. Accordingly, based on Appellant's understanding of Iwami, Appellant groups the claims as follows:

GROUP 1: Claims 1, 14, 16 and 24
GROUP 2: Claim 2
GROUP 3: Claims 15 and 20
GROUP 4: Claims 21 and 29
GROUP 5: Claim 22
GROUP 6: Claim 4
GROUP 7: Claim 5
GROUP 8: Claim 6
GROUP 9: Claim 25
GROUP 10: Claim 26
GROUP 11: Claim 7
GROUP 12: Claim 9
GROUP 13: Claim 10

GROUP 14: Claim 27

GROUP 15: Claims 11 and 12

GROUP 16: Claim 13

GROUP 17: Claim 28

GROUP 18: Claims 3, 17 and 18

GROUP 19: Claim 23

GROUP 20: Claim 8

Thus, Appellant intends that the claims do not stand and fall together as grouped by the Examiner, but rather as grouped above. As explained below, each of the above groups is believed to be separately patentable over the applied art. In particular, each identified group recites at least one additional feature that provides an additional reason why each claim in such group is not anticipated or rendered obvious, as the case may be, by the applied art.

VIII. ARGUMENT

DISCUSSION OF THE REFERENCE RELIED UPON BY THE EXAMINER

Iwami is directed to a hands-free communication apparatus for utilizing multiple microphones in connection with a wireless telephone set. By providing microphones at different positions within an automobile, Iwami attempts to permit one or more passengers in the automobile, as well as the driver, to participate in a telephone conversation. In order to implement this configuration, Iwami must combine inputs from two or more different microphones.

Rather than adding such multiple inputs, Iwami proposes subtracting the microphone inputs in an attempt to simultaneously reduce noise. Specifically, Iwami's

technique appears to be based on the belief that audio noise picked up by the various microphones is likely to be more highly correlated than speech sounds picked up at such microphones; as a result, subtracting the inputs will reduce input noise more than input speech.

However, it should be noted that even Iwami apparently does not consider his technique to be independently effective at reducing noise, but rather as simply a better way of combining inputs from different microphones in an automobile, when such combination is otherwise necessary. This is evidenced by the fact that Iwami suggests switching off a microphone if it is not required to pick up sound, "to improve the articulation of target speech." Column 5, lines 47 to 50. Clearly, if Iwami believed his technique were independently effective at noise reduction, he instead would have recommended that the second microphone be left on, regardless of whether it is required to pick up speech. This portion of the Iwami reference therefore can only mean that Iwami believes that, even when using his technique, the second microphone results in additional noise, although probably less overall additional noise than if the microphone inputs were added rather than being subtracted.

It is further noted that Iwami is directed solely to a method of combining microphone inputs that attempts to minimize <u>input</u> audio noise. Nothing in Iwami mentions, or suggests any solution to, the problem of noise experienced by a circuit.

<u>DISCUSSION OF ISSUES ON APPEAL</u>

A. <u>§ 102 Rejections</u>.

The requirements for a § 102 rejection are as follows.

"For a prior art reference to anticipate in terms of 35 U.S.C. § 102, every element in the claimed invention must be shown in a single reference." <u>In re Bond</u>, 910 F.2d 831, 832, 15 USPQ2d 1566, 1567 (Fed. Cir. 1990)

(quoting Diversitech Corp. v. Century Steps, Inc., 850 F.2d 675, 677, 7 USPQ2d 1315, 1317 (Fed. Cir. 1988)).

As discussed below, these requirements are not met for any of the following groups of claims.

Group 1 Claims.

Claims 1 and 24 are directed to a circuit which includes a first circuit, a second circuit and a subtractor circuit. The first circuit has a first input and a first output, which includes a function of a signal at the first input and also includes a first noise component resulting from noise experienced by the first circuit. The second circuit is located proximal to the first circuit and has a second input and a second output, the second output including a function of a signal at the second input and also including a second noise component resulting from noise experienced by the second circuit. It is a feature of this aspect of the invention that the second noise component is approximately equal to the first noise component. The subtractor circuit is connected to the first circuit and to the second circuit and subtracts the second output from the first output.

Claims 14 and 16 are directed to a noise cancellation method in which a first signal is supplied to a first circuit, and a first output is read from the first circuit. A signal is supplied to a second circuit which results in a null output from the second circuit, the second circuit being located proximal to the first circuit. A second output is read from the second circuit, and the first output is combined with the second output to produce a combinational output. It is a feature of Claim 16 that a noise component of the first output due to noise experienced by the first circuit is approximately equal to a noise component of the second circuit due to noise experienced by the second circuit.

Iwami does not show, with the particularity required by MPEP § 2131, at least the following features of the above claims. First, Iwami does not show two circuits having output noise components, resulting from noise experienced by the circuits, that are approximately equal. In this regard, Iwami discusses subtracting the outputs of two amplifier circuits whose inputs are connected to different microphones. However, Iwami does not say anything about noise experienced by those amplifiers, and certainly does not disclose that the output noise components of the two amplifiers due to such noise are approximately equal. It has not even been alleged in the Office Action that Iwami discloses this feature of the invention.

Second, Iwami does not disclose a second circuit located proximal to a first circuit, where the output of the second circuit is subtracted from the output of the first circuit. Although Figure 2 of Iwami shows two amplifiers whose outputs are subtracted, nothing in Iwami expressly or inherently discloses that those two amplifiers are to be placed proximal to each other in the physical layout of the circuit. Once again, it has not even been alleged in the Office Action that Iwami discloses this feature of the invention.

In view of the foregoing remarks, Claims 1, 14, 16 and 24 could not possibly have been anticipated by Iwami.

<u>Group 2 Claim</u>.

Claim 2 depends from claim 1 and recites the additional feature that the circuit also includes a digital circuit located proximate to the first circuit and to the second circuit. As noted above, the present invention is particularly applicable to mixed signal circuits, in which noise from a digital circuit often corrupts the output of other circuits, such as analog circuits. By utilizing a second circuit as recited in claim 2 the effects of such noise often can be largely negated.

While the present Office Action has not addressed this feature, the previous Office Action alleged that "the digital circuit is anticipated by a control section (16)" of Iwami. This argument is believed to be incorrect for the following reasons. First, there is absolutely no indication in Iwami that control section 16 is a digital circuit. The only function ascribed to control section 16 is regulation of volume (speech level). Column 3, lines 56 to 57. Thus, if anything, it seems more likely that control section 16 is intended to be an analog circuit. Moreover, there is no indication that control section 16 is placed proximate to Iwami's input amplifiers. Accordingly, for the foregoing additional reasons, claim 2 could not have been anticipated by Iwami.

<u>Group 3 Claim</u>.

Claim 20 depends from claim 1 and claim 15 depends from claim 14. Each recites the additional feature that the second circuit is identical to the first circuit. Nowhere does Iwami say that his two input amplifiers are identical. The Office Action does not even allege that Iwami discloses this feature. For this additional reason, Iwami could not have anticipated claim 15 or claim 20.

<u>Group 4 Claims</u>.

Claim 21 depends from claim 1 and claim 29 depends from claim 14. Each recites the additional feature that the noise experienced by the first circuit and the second circuit (resulting in the approximately equal noise components) is electromagnetic environmental noise. Iwami does not disclose that the noise components resulting from electromagnetic environmental noise experienced by his input amplifiers are approximately equal. The Office Action does not even allege that Iwami discloses this feature. For this additional reason, Iwami could not have anticipated claim 21 or claim 29.

Group 5 Claim.

Claim 22 depends from claim 1 and recites the additional feature that the second circuit is located close enough to the first circuit so that the second circuit experiences approximately the same noise as the first circuit. Iwami does not disclose this feature of the invention and the Office Action does not even allege that it does. For this additional reason, Iwami could not have anticipated claim 22.

Group 6 Claim.

Independent claim 4 is directed to a circuit that includes first, second and third circuits. The first circuit has a first input and a first output, the first output including a function of a signal at the first input and also including a first noise component resulting from noise experienced by the first circuit. The second circuit has a second input and a second output, the second output including an input signal component which is a function of a signal at the second input and also including a second noise component resulting from noise experienced by the second circuit, the input signal component being a null output, and the second noise component being approximately equal to the first noise component. The third circuit has a third input connected to the first output and a fourth input connected to the second output to subtract the second output from the first output.

Iwami does not disclose the foregoing combination of features. In particular, Iwami fails to show, as required for a § 102 rejection, at least the feature of two circuits having output noise components, resulting from noise experienced by the circuits, that are approximately equal. In this regard, Iwami discusses subtracting the outputs of two amplifier circuits whose inputs are connected to different microphones. However, Iwami does not say anything about noise experienced by those amplifiers, and certainly does not disclose that the output noise components of the two amplifiers due to such noise

are approximately equal. It has not even been alleged in the Office Action that Iwami discloses this feature of the invention. Accordingly, claim 4 is allowable over Iwami.

Group 7 Claim.

Claim 5 depends from claim 4 and recites the additional feature of a digital circuit located proximal to the first circuit and to the second circuit. While the present Office Action has not addressed this feature, the previous Office Action alleged that "the digital circuit is anticipated by a control section (16)" of Iwami. This argument is believed to be incorrect for the following reasons. First, there is absolutely no indication in Iwami that control section 16 is a digital circuit. The only function ascribed to control section 16 is regulation of volume (speech level). Column 3, lines 56 to 57. Thus, if anything, it seems more likely that control section 16 is intended to be an analog circuit. Moreover, there is no indication that control section 16 is placed proximal to Iwami's input amplifiers. Accordingly, for the foregoing additional reasons, claim 5 could not have been anticipated by Iwami.

Group 8 Claim.

Claim 6 depends from claim 5 and recites the additional feature that the first circuit, second circuit, third circuit and digital circuit are on a single integrated circuit chip. As noted above, Iwami does not describe a digital circuit as recited in claim 5. Accordingly, Iwami could not have said anything about such a digital circuit being located on the same integrated circuit chip as any other component. Moreover, Iwami does not even disclose that his three amplifiers are located on a single integrated circuit chip, and the Examiner has not even alleged that it does. Thus, for the foregoing additional reasons, claim 6 could not have been anticipated by Iwami.

Group 9 Claim.

Claim 25 depends from claim 4 and recites the additional feature that the second circuit is identical to the first circuit. Nowhere does Iwami say that his two input amplifiers are identical. The Office Action does not even allege that Iwami discloses this feature. For this additional reason, Iwami could not have anticipated claim 25.

Group 10 Claim.

Claim 26 depends from claim 4 and recites the additional feature that the noise experienced by the first circuit and the second circuit (resulting in the approximately equal noise components) is electromagnetic environmental noise. Iwami does not disclose that the noise components resulting from electromagnetic environmental noise experienced by his input amplifiers are approximately equal. In fact, the Office Action does not even allege that Iwami discloses this feature. For this additional reason, Iwami could not have anticipated claim 26.

Group 11 Claim.

Independent claim 7 is directed to a circuit that includes a first circuit having a first input and a first output, the first output including a function of a signal at the first input and also a noise component resulting from noise experienced by the first circuit. Also provided is a second circuit having a second input and a second output, a signal supplying circuit supplying to the second input a signal which is the inverse of the signal at the first input. A third circuit has a third input connected to the first output and a fourth input connected to the second output, and subtracts the second output from the first output.

Iwami does not disclose the foregoing combination of features. In particular, Iwami fails to show at least the feature of supplying to the input of a second circuit a

signal that is the inverse of the signal supplied to the input of a first circuit. Once again, the Examiner has not even alleged that Iwami shows this feature of the invention. Accordingly, Iwami could not have anticipated claim 7.

Group 12 Claim.

Claim 9 depends from claim 7 and recites the additional feature of a digital circuit located proximal to the first circuit and to the second circuit. While the present Office Action has not addressed this feature, the previous Office Action alleged that "the digital circuit is anticipated by a control section (16)" of Iwami. This argument is believed to be incorrect for the following reasons. First, there is absolutely no indication in Iwami that control section 16 is a digital circuit. The only function ascribed to control section 16 is regulation of volume (speech level). Column 3, lines 56 to 57. Thus, if anything, it seems more likely that control section 16 is intended to be an analog circuit. Moreover, there is no indication that control section 16 is placed proximal to Iwami's input amplifiers. Accordingly, for the foregoing additional reasons, claim 9 could not have been anticipated by Iwami.

Group 13 Claim.

Claim 10 depends from claim 9 and recites the additional feature that the first circuit, second circuit, third circuit and digital circuit are on a single integrated circuit chip. As noted above, Iwami does not describe a digital circuit as recited in claim 9. Accordingly, Iwami could not have said anything about such a digital circuit being located on the same integrated circuit chip as any other component. Moreover, Iwami does not even disclose that his three amplifiers are located on a single integrated circuit chip, and the Examiner has not even alleged that it does. Thus, for the foregoing additional reasons, claim 10 could not have been anticipated by Iwami.

Group 14 Claim.

Claim 27 depends from claim 7 and recites the additional feature that the second circuit is identical to the first circuit. Nowhere does Iwami say that his two input amplifiers are identical. The Office Action does not even allege that Iwami discloses this feature. For this additional reason, Iwami could not have anticipated claim 27.

Group 15 Claims.

Claims 11 and 12 are directed to an integrated circuit chip (IC) which includes a plurality of analog circuits, each proximal to each other, and each producing an output signal which includes a function of an input signal and also includes a noise component resulting from noise experienced by the plurality of analog circuits. A noise separator circuit, proximal to the plurality of analog circuits, produces a noise signal based on noise experienced by the noise separator circuit, with the noise signal being approximately equal to the noise component of the output signal output by each of the plurality of analog circuits. A noise canceling circuit processes the output signals with the noise signal to reduce the noise component of the output signal output by each of the plurality of analog circuits.

Iwami does not disclose the foregoing combination of features. In particular, Iwami does not disclose at least the following features of claims 11 and 12. First, Iwami says nothing about a plurality of analog circuits and a noise separator circuit producing a noise signal based on noise experienced by the noise separator circuit that is approximately equal to the noise components resulting from noise experienced by the plurality of analog circuits. In this regard, Iwami discusses subtracting the outputs of two amplifier circuits whose inputs are connected to different microphones. However, Iwami does not say anything about noise experienced by those amplifiers, and certainly does not disclose that the output noise components of the two amplifiers due to such

noise are approximately equal. It has not even been alleged in the Office Action that Iwami discloses this feature of the invention.

Second, Iwami does not disclose that the plurality of analog circuits are located proximal to each other and to such a noise separator circuit. Although Figure 2 of Iwami shows two amplifiers whose outputs are subtracted, nothing in Iwami expressly or inherently discloses that those two amplifiers are to be placed proximal to each other in the physical layout of the circuit. Once again, it has not even been alleged in the Office Action that Iwami discloses this feature of the invention.

Accordingly, claims 11 and 12 could not have been anticipated by Iwami.

Group 16 Claim.

Claim 13 depends from claim 11 and includes the additional feature that the noise canceling circuit includes a halving circuit which inputs a signal having an input amplitude and outputs the signal at one-half the input amplitude. Nowhere does Iwami disclose this feature of the invention, and the Examiner has not even alleged that it does. Thus, for this additional reason, claim 13 could not have been anticipated by Iwami.

Group 17 Claim.

Claim 28 depends from claim 11 and recites the additional feature that the noise experienced by the plurality of analog circuits (resulting in the approximately equal noise components) is electromagnetic environmental noise. Iwami does not disclose that the noise components resulting from electromagnetic environmental noise experienced by his input amplifiers are approximately equal. The Office Action does not even allege that Iwami discloses this feature. For this additional reason, Iwami could not have anticipated claim 28.

B. § 103 Rejections.

The requirements for a establishing a *prima facie* case for a § 103 rejection have been stated as follows.

> "a proper analysis under § 103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. [citing In re Dow Chemical Co., 837 F.2d 469, 473, 5 U.S.P.Q.2D 1529, 1531 (Fed. Cir. 1988).] Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure."
>
> In re Vaeck, 947 F.2d 488, 493 (Fed. Cir. 1991)

Thus, for example, In re Fine, 837 F.2d 1071 (Fed. Cir. 1988) concerned a case in which the patent examiner had rejected a claims for system for detecting nitrogen compounds, based on a combination of two references: the "Eads" patent that disclosed a method for separating, identifying and monitoring sulfur compounds and the "Warmick" patent that disclosed a nitric oxide detector. Specifically, the examiner had simply asserted that it would have been obvious to substitute Warmick's nitric oxide detector for the sulfur detector of Eads if one were interested in nitrogen compounds.

The Federal Circuit reversed, noting that the problems in analyzing sulfur compounds are significantly different than the problems in analyzing nitrogen compounds. Accordingly, the combination of those two references at most would have suggested that it was obvious to try such a combination, noting, "whether a particular combination might be 'obvious to try' is not a legitimate test of patentability." [citations omitted]. Id. at 1075. Because Eads notes that the presence of nitrogen in his system is undesirable, the Federal Circuit also concluded that Eads actually teaches away from

such a combination. The Federal Circuit therefore held that the examiner had not established a *prima facie* case of obviousness.

As discussed below, the above requirements for establishing a *prima facie* case of obviousness are not met for any of the following groups of claims.

Group 18 Claims.

Claim 3 depends from claim 1 and claim 17 depends from claim 14. It is noted that neither claim 1 nor claim 14 alone would not have been obvious in view of Iwami. In this regard, Iwami does not suggest at least the feature of combining the outputs of two circuits having output noise components, resulting from noise experienced by the circuits, that are approximately equal. Rather, Iwami merely discusses subtracting the outputs of two amplifier circuits whose inputs are connected to different microphones. However, Iwami does not say anything about noise experienced by those amplifiers, and certainly does not suggest that the output noise components of the two amplifiers due to such noise should be approximately equal.

As noted above, Iwami is solely concerned with reducing input noise, and therefore suggests nothing about noise experienced by his individual circuits. The Examiner has not even explained how making such output noise components approximately equal would have furthered Iwami's goals. Accordingly, there would have been no motivation in Iwami to expend the effort, and otherwise limit the available physical design choices (as described in detail above), which would be required to achieve this result.

In fact, as noted above, Iwami recommends turning off the second microphone when it is not in use, in order to reduce noise. This strongly suggests that the output noise components of Iwami's amplifiers are not intended to be approximately equal.

Claim 3 recites the additional feature that the subtractor circuit further includes a halving circuit which inputs a signal having an input amplitude and outputs the signal at one-half the input amplitude. Claim 18 recites the additional feature that the step of combination includes the step of inputting a signal having an input amplitude and outputting the signal at one-half the input amplitude.

In rejecting claims 3 and 18, the Examiner simply noted that a skilled artisan would be motivated to employ a subtractor having a halving circuit in the Iwami circuit for further reducing the magnitude of the output signal. However, the Examiner has not cited to anything in Iwami that suggests the desirability of reducing the magnitude of the output signal at all, much less that the output should be reduced by one-half. Thus, for this additional reason, claims 3 and 18 would not have been obvious in view of Iwami.

In view of the foregoing remarks, claims 3, 17 and 18 are believed to be allowable over Iwami.

<u>Group 19 Claim</u>.

Claim 23 depends from independent claim 1. It is noted that claim 1 alone would not have been obvious in view of Iwami. In this regard, Iwami does not suggest at least the feature of subtracting the outputs of two circuits having output noise components, resulting from noise experienced by the circuits, that are approximately equal. In this regard, Iwami discusses subtracting the outputs of two amplifier circuits whose inputs are connected to different microphones. However, Iwami does not say anything about noise experienced by those amplifiers, and certainly does not suggest that the output noise components of the two amplifiers due to such noise should be approximately equal.

As noted above, Iwami is solely concerned with reducing input noise, and therefore suggests nothing about noise experienced by his individual circuits. The

Examiner has not even explained how making such output noise components approximately equal would have furthered Iwami's goals. Accordingly, there would have been no motivation in Iwami to expend the effort, and otherwise limit the available physical design choices (as described in detail above), which would be required to achieve this result.

In fact, as noted above, Iwami recommends turning off the second microphone when it is not in use, in order to reduce noise. This strongly suggests that the output noise components of Iwami's amplifiers are not intended to be approximately equal.

Accordingly, claim 23 would not have been obvious in view of Iwami.

Group 20 Claim.

Claim 8 depends from claim 7. It is noted that claim 7 alone would not have been obvious in view of Iwami. In this regard, Iwami does not suggest at least the feature of supplying to the input of a second circuit a signal that is the inverse of the signal supplied to the input of a first circuit. Rather, Iwami only discusses inputting different speech signals to his different amplifiers, or else completely turning off one of the microphones. The Examiner has provided no motivation to modify Iwami's apparatus in such a manner. In fact, such a modification would have destroyed Iwami's central purpose of combining different speech signals.

Claim 8 includes the additional feature that the third circuit includes a halving circuit which inputs a signal having an input amplitude and outputs the signal at one-half the input amplitude. In rejecting claim 8, the Examiner simply noted that a skilled artisan would be motivated to employ a subtractor having a halving circuit in the Iwami circuit for further reducing the magnitude of the output signal. However, the Examiner has not cited to anything in Iwami that suggests the desirability of reducing the magnitude of the output signal at all, much less that the output should be reduced by

one-half. Thus, for this additional reason, the claim 8 would not have been obvious in view of Iwami.

Accordingly, claim 8 is believed to be allowable over Iwami.

CONCLUDING REMARKS

As Appellant has shown above, for a number of reasons, nothing in the cited reference discloses, teaches, or suggests the inventions recited by the claims on appeal. Appellant therefore respectfully submits that the claimed invention is patentably distinct over the prior art.

In view of the foregoing, Appellant respectfully requests that the rejection of Claims 1 to 18 and 20 to 29 be reversed and a Notice of Allowance issued.

Respectfully submitted,

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Dated: June 28, 1999

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APPENDIX

Claims on Appeal

1. A circuit comprising:

a first circuit having a first input and a first output, wherein said first output includes a function of a signal at said first input and also includes a first noise component resulting from noise experienced by said first circuit;

a second circuit, located proximal to said first circuit and having a second input and a second output, wherein said second output includes a function of a signal at said second input and also includes a second noise component resulting from noise experienced by said second circuit, and wherein the second noise component is approximately equal to the first noise component; and

a subtractor circuit connected to said first circuit and to said second circuit to subtract said second output from said first output.

2. A circuit according to claim 1 further comprising a digital circuit located proximate to said first circuit and to said second circuit.

3. A circuit according to claim 1 wherein said subtractor circuit further comprises a halving circuit which inputs a signal having an input amplitude and outputs the signal at one-half the input amplitude.

4. A circuit comprising:

a first circuit having a first input and a first output, wherein said first output includes a function of a signal at said first input and also includes a first noise component resulting from noise experienced by said first circuit;

a second circuit having a second input and a second output, wherein said second output includes an input signal component which is a function of a signal at said second input and also includes a second noise component resulting from noise experienced by said second circuit, wherein the input signal component is a null output, and wherein the second noise component is approximately equal to the first noise component; and

a third circuit having a third input connected to said first output and a fourth input connected to said second output to subtract said second output from said first output.

5. A circuit according to claim 4, further comprising a digital circuit proximal to said first circuit and to said second circuit.

6. A circuit according to claim 5, wherein said first circuit, said second circuit, said third circuit, and said digital circuit are on a single integrated circuit chip.

7. A circuit comprising:

a first circuit having a first input and a first output, wherein said first output includes a function of a signal at said first input and also includes a noise component resulting from noise experienced by said first circuit;

a second circuit having a second input and a second output;

a signal supplying circuit supplying to the second input a signal an inverse of the signal at the first input; and

a third circuit having a third input connected to said first output and a fourth input connected to said second output, and subtracting said second output from said first output.

8. A circuit according to claim 7 wherein said third circuit further comprises a halving circuit which inputs a signal having an input amplitude and outputs the signal at one-half the input amplitude.

9. A circuit according to claim 7, further comprising a digital circuit proximal to said first circuit and to said second circuit.

10. A circuit according to claim 9, wherein said first circuit, said second circuit, said third circuit, and said digital circuit are on a single integrated circuit chip.

11. An integrated circuit chip (IC) comprising:

a plurality of analog circuits, each proximal to each other, and each of said plurality of analog circuits producing an output signal which includes a function of an input signal and also includes a noise component resulting from noise experienced by said plurality of analog circuits;

a noise separator circuit, proximal to said plurality of analog circuits, and producing a noise signal based on noise experienced by said noise separator circuit, wherein the noise signal is approximately equal to the noise component of the output signal output by each of the plurality of analog circuits; and

a noise canceling circuit which processes said output signals with said noise signal to reduce the noise component of the output signal output by each of the plurality of analog circuits.

12. An IC according to claim 11 wherein said noise canceling circuit comprises a subtractor circuit.

13. An IC according to claim 11 wherein said noise canceling circuit further comprises a halving circuit which inputs a signal having an input amplitude and outputs the signal at one-half the input amplitude.

14. A noise cancellation method comprising the steps:

supplying a first signal to a first circuit;

reading a first output from said first circuit;

supplying a signal to a second circuit which results in a null output from the second circuit, wherein said second circuit is located proximal to said first circuit;

reading a second output from said second circuit;

combining said first output with said second output to produce a combinational output,

wherein a noise component of the first output due to noise experienced by said first circuit is approximately equal to a noise component of the second circuit due to noise experienced by said second circuit.

15. A method according to claim 14 wherein said second circuit is identical to said first circuit.

16. A method according to claim 14 wherein said step of combination comprises the step of subtracting said second output from said first output.

17. A method according to claim 14 wherein said step of combination comprises the step of adding said second output to said first output to produce an added output.

18. A method according to claim 17 wherein said step of combination further comprises the step of inputting a signal having an input amplitude and outputting the signal at one-half the input amplitude.

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20. A circuit according to claim 1, wherein said second circuit is identical to said first circuit.

21. A circuit according to claim 1, wherein the noise experienced by said first circuit and said second circuit is electromagnetic environmental noise.

22. A circuit according to claim 1 wherein said second circuit is located close enough to said first circuit so that said second circuit experiences approximately the same noise as said first circuit.

23. A circuit according to claim 1, wherein said subtractor circuit is digital.

24. A circuit according to claim 1, wherein said subtractor circuit is analog.

25. A circuit according to claim 4, wherein said second circuit is identical to said first circuit.

26. A circuit according to claim 4, wherein the noise experienced by said first circuit and said second circuit is electromagnetic environmental noise.

27. A circuit according to claim 7, wherein said second circuit is identical to said first circuit.

28. A circuit according to claim 11, wherein the noise experienced by said plurality of analog circuits and said noise separator circuit is electromagnetic environmental noise.

29. A circuit according to claim 14, wherein the noise experienced by said first circuit and said second circuit is electromagnetic environmental noise.